

Investigation

3

Equations With Two or More Variables

You have done a lot of work with relationships involving two related variables. However, many real-world relationships involve three or more variables. For example, consider this situation:

The eighth-graders are selling T-shirts and caps to raise money for their end-of-year party. They earn a profit of \$5 per shirt and \$10 per cap.

This situation involves three variables: the *number of T-shirts sold*, the *number of caps sold*, and the *profit*. The profit for the fundraiser depends on the number of caps and the number of T-shirts sold.

Getting Ready for Problem 3.1

- What equation shows how the profit p is related to the number of shirts sold s and the number of caps sold c ?
- Find the profit if the students sell
 - 30 shirts and 50 caps
 - 15 shirts and 10 caps
 - 12 shirts and 20 caps
- What do you think it means to *solve* an equation with three variables?
- What ideas do you have for finding solutions to the equation?

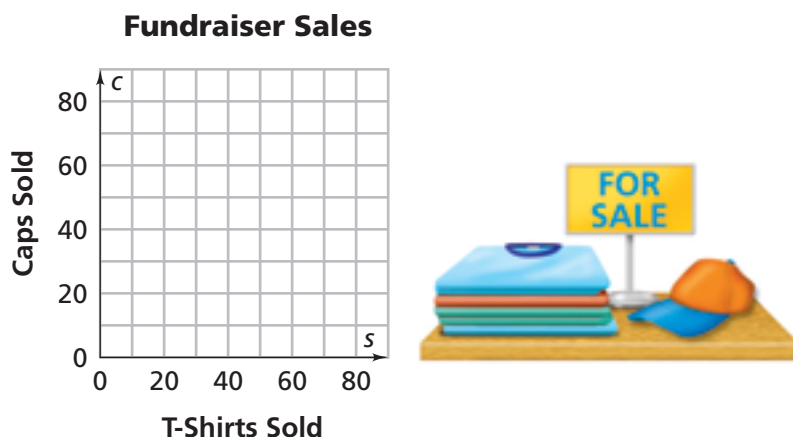


3.1 Many Ways to Reach a Goal

The equation relating p , s , and c represents every possible combination of T-shirts, caps, and profit values for the fundraiser. Suppose the class sets a profit goal of $P = \$600$. Finding combinations of T-shirt and cap sales that meet this goal requires solving an equation with only two variables, s and c .

Problem 3.1 Solving Equations With Two Variables

- A. Find five pairs of numbers for shirt and cap sales that will allow the students to make a \$600 profit exactly.
- B. 1. Each answer for Question A can be expressed as an ordered pair (s, c) . Plot these ordered pairs on a grid like the one below.



2. Is there a pattern in the points that suggests other solutions of the equation $600 = 5s + 10c$? Explain.
 - C. The equations in parts (1)–(4) are of the form $c = ax + by$ or $ax + by = c$. For each equation,
 - find at least five solution pairs (x, y)
 - plot the solutions
 - find a pattern in the points and use the pattern to predict other solution pairs
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| <ol style="list-style-type: none"> 1. $5 = x - y$ 3. $2x + y = 3$ | <ol style="list-style-type: none"> 2. $10 = x + y$ 4. $-3x + 2y = -4$ |
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- D. What does your work on Question C suggest about the graph of solutions for any equation of the form $ax + by = c$ or $c = ax + by$, where a , b , and c are fixed numbers?

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